STREAMING VIDEO MODELING FOR ROBOTICS TELEOPERATION

Paul Bounker
US Army TARDEC
586 282-5297
paul.j.bounker.civ@mail.mil

Report Documentation Page

Form Approved
OMB No. 0704-0188

1. REPORT DATE	2. REPORT TYPE	3. DATES COVERED
02 AUG 2011	**N/A**	**-**

4. TITLE AND SUBTITLE	5a. CONTRACT NUMBER
Streaming Video Modeling for Robotics Teleoperation	5b. GRANT NUMBER
	5c. PROGRAM ELEMENT NUMBER
6. AUTHOR(S)	5d. PROJECT NUMBER
Paul Bounker	5e. TASK NUMBER
	5f. WORK UNIT NUMBER
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)	8. PERFORMING ORGANIZATION REPORT NUMBER
US Army RDECOM-TARDEC 6501 E 11 Mile Rd Warren, MI 48397-5000, USA	**22151**
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)	10. SPONSOR/MONITOR'S ACRONYM(S)
US Army RDECOM-TARDEC 6501 E 11 Mile Rd Warren, MI 48397-5000, USA	**TACOM/TARDEC/RDECOM**
	11. SPONSOR/MONITOR'S REPORT NUMBER(S) **22151**

12. DISTRIBUTION/AVAILABILITY STATEMENT
Approved for public release, distribution unlimited

13. SUPPLEMENTARY NOTES
Presented at the 2011 NDIA Vehicles Systems Engineering and Technology Symposium 9-11 August 2011, Dearborn, Michigan, USA, The original document contains color images.

14. ABSTRACT

15. SUBJECT TERMS

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT	b. ABSTRACT	c. THIS PAGE			
unclassified	**unclassified**	**unclassified**	**SAR**	**11**	

AGENDA

ROBOTIC SYSTEMS

- Purpose
- System Architecture
- JGRE FY11 Objectives
- Current Progress
- Communications Model
- Next Steps
- Long Term Plan
- Future Uses

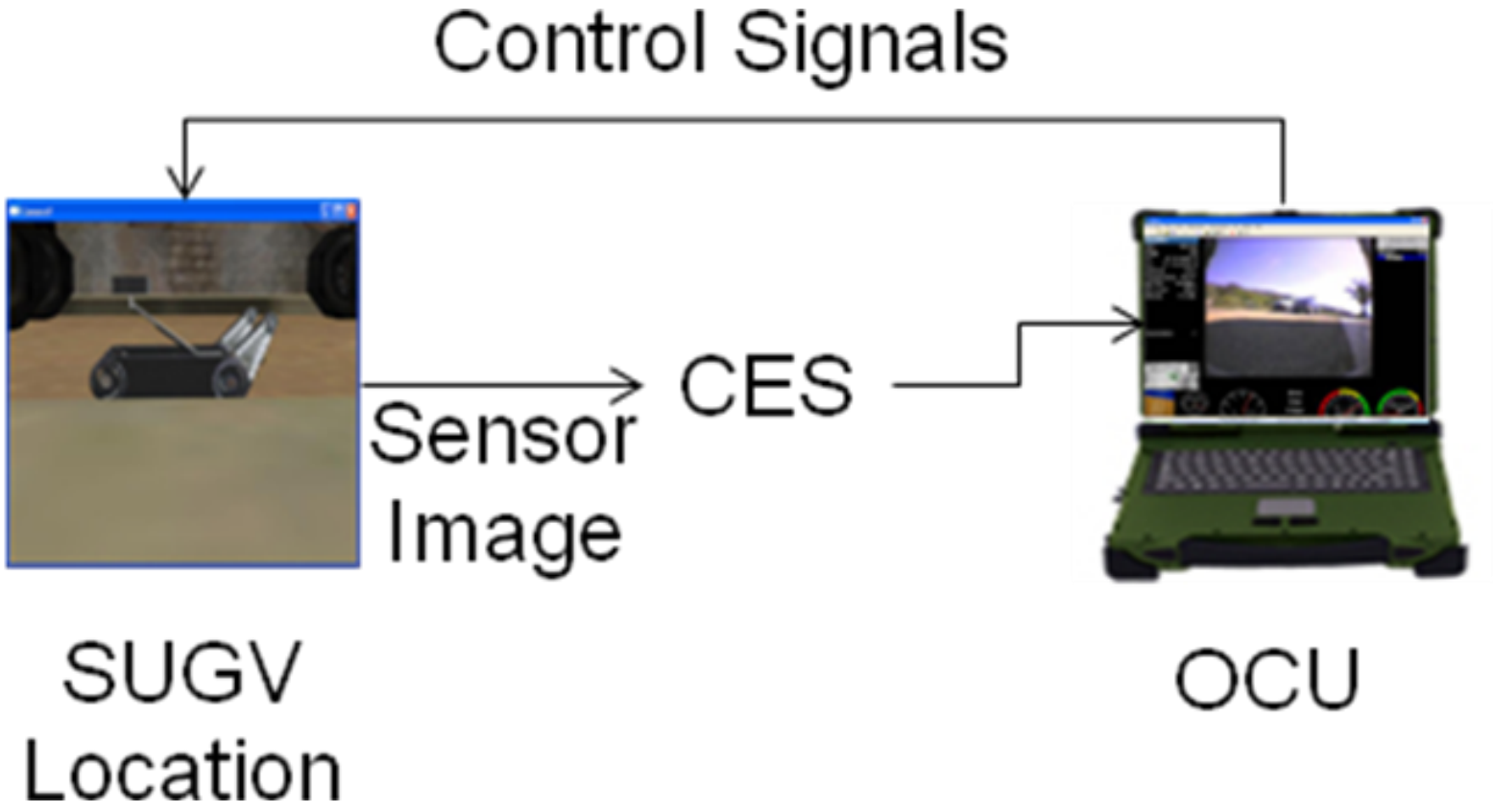
PURPOSE

ROBOTIC SYSTEMS

- Reduces Range Testing Costs
  - Range Testing is sometimes inconclusive
  - Impacts Schedule
- Manipulation Technologies development
  - Tradeoff analysis for payloads dependent on streaming video
- Collaborative Operations
  - Evaluation of manned and unmanned systems
  - Sharing of information such as fusion and positioning
- Interoperability
  - Tradeoff analysis for different communications approaches

SYSTEM ARCHITECTURE

ROBOTIC SYSTEMS



FY11 GOALS

ROBOTIC SYSTEMS

- Goal 1: Reuse or modify as needed existing PEO-I CES JTRS models
- Goal 2: Demonstrate the ability to show the simulated impacts on streaming video of the JTRS model
- Goal 3: Demonstrate the ability to show simulated impacts on streaming video of DDL model
- Goal 4: Demonstrate the ability to show simulated impacts on streaming video of the CREW - DUKE model

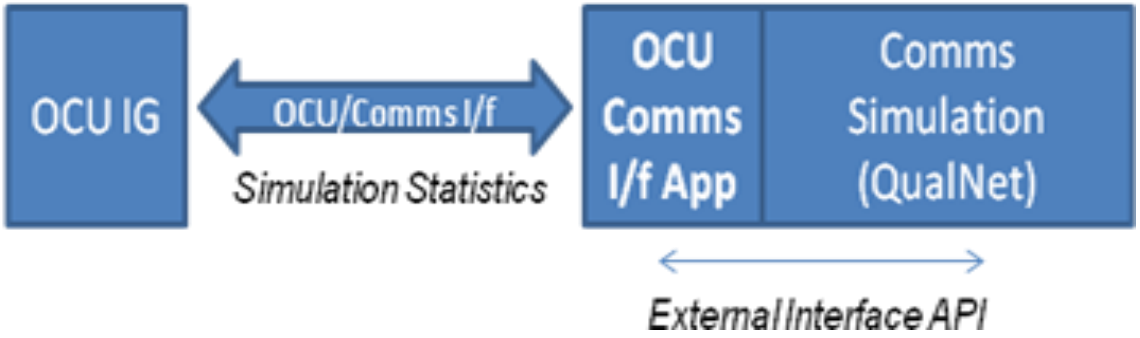
Demonstrate the Capability to do Tradeoff Analysis of Radios Performing Tele-Operation in a Simulated Mission Environment

CURRENT PROGRESS

ROBOTIC SYSTEMS

- Leveraging existing PEO-I Comms Effects Server Qualnet Modeling of JTRS radio
- Developed Ubiquiti radio/antenna Model
- SUGV model being used is from the Common Controller program
- Entity state PDUs are being used to update locations and streaming video model
- Streaming video model receives Ubiquiti radio/antenna model performance attributes and displays, jitter, smearing, dropouts, etc.
- Currently using WSMR database, being used be PEO-I for Increment 1 testing.

COMMUNICATIONS MODEL



- Scalable Network Technologies (SNT) – QualNet/CES Developer Network and Communications Simulation Package

Provides

- *Architecture*
- *Graphics*
- *Statistics*
- *External Interfaces (*DIS, Socket to IG)

COMMUNICATIONS MODEL SCENARIO

ROBOTIC SYSTEMS

- Simulation Duration: 3.5 min (210 sec)
- Data tx from 1 sec to 180 sec to allow time for all data to be transmitted and received.
- 2 Nodes:
  - OCU, 1 Radio
  - SUGV, 1 Radio
- DIS Interface for Mobility Models (OCU, SUGV)
- Terrain (WSMR, 32N 107W)
- Urban Model Auto Select Propagation Model
- Metropolitan Path loss Model

NEXT STEPS

ROBOTIC SYSTEMS

- Evaluation of JTRS/SRW 1.1
- Evaluation of DDL
- Demonstration of Repeaters
- Demonstration of Encryption
- Demonstration of Jamming Effects

LONG TERM PLAN

ROBOTIC SYSTEMS

- Evaluate communications impacts from inside buildings to include different material types (steel, wood, concrete, etc.) (2012)
- The impact from Urban Canyons to be addressed (2012)
- Weather (rain, snow, wind, smoke) impacts on streaming video communications (2013)
- Node hopping, self healing, fusion, situational awareness and their resultant impacts on streaming video capabilities (2014)

FUTURE USES

ROBOTIC SYSTEMS

- Evaluate dead spots/dropouts for field testing
- Interest by SPAWAR and NAVEODTECH
- IED jamming issues could be addressed
- As autonomy continues to increase, additional capabilities such as target acquisition and engagement in a reduced communications environment can be studied and worked on with appropriate degradation to video and sensor images
- Teaming algorithms could be developed and assessed in a degraded communications environment